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| 10/047,382      | 01/14/2002  | Sujit Sharan         | MI22-1902           | 4830             |

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EXAMINER

GHYKA, ALEXANDER G

|          |              |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2812

DATE MAILED: 03/14/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/047,382

Applicant(s)

SHARAN ET AL

Examiner

Alexander G. Ghysa

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 42-62 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 42-62 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449, Paper No(s) 3)
- 4) ☐ Interview Summary (PTO-413, Paper No(s) \_\_\_\_)
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other

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## DETAILED ACTION

### *Claim Rejections - 35 U.S.C. § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

3. **Claims 42-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shan et al (US 5,865,937) in view of Shan et al (US 5,605,637) and Beisswenger et al (US 5,102,523).**

4. Shan et al ('937) discloses a plasma reactor containing at least a reactant gas at a selected pressure and a semiconductor wafer to be processed, a pair of electrodes for capacitively coupling a radio frequency power into the chamber and a radio frequency source having a radio frequency

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power terminal, and a circuit for coupling the radio frequency source to the pair of electrodes. Said circuit includes a coil having plural conductive windings and a pair of terminals coupled to a pair of electrodes. One of the windings is connected to the power terminal of the radio frequency source, and a grounded conductive tap contacting the windings between a pair of terminals varies the ratio of power apportioned between the electrodes. See the Abstract. Moreover, Shan et al ('937) describe using a component (Figure 1, # 60) of the phase inverting match circuit (Figure 1, # 40) for preselecting an anode-cathode power ratio (column 3, lines 35-42), and further discloses a power splitter.

5. Shan et al ('937) differs from the presently claimed invention in that it does not disclose selecting a power ratio based on the electrode area ratio.

6. Shan et al ('637) describe an apparatus which includes a grounded reactor chamber having conductive walls; a grounded first electrode located in the chamber; a second electrode spaced apart from the first electrode; at least one inlet port for supplying process gases to the chamber; at least one outlet port for evacuating gases from the chamber; a high frequency power source connected between the second electrode and the ground to generate and sustain a plasma in the reactor; and a plasma shield installed in the reactor chamber to prevent the plasma from reaching a portion of the reactor chamber. See column 6, lines 50-70. The effective area of the grounded first electrode is reduced because the plasma is prevented from contacting the full extent of the chamber walls, and the reduced effective area results in a reduced dc bias on the second electrode

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(column 2, lines 24-44). Shan et al additionally describes a proportionality relationship (column 4, line 15) between the DC bias on the cathode (Figure 1, #12) and the ratio of the areas of both the upper grounded electrode and the lower RF driven electrode raised to a constant. Shan et al (\*637) further discusses how the ratio of the areas described in said relationship can have a value other than unity. Support for this conclusion is drawn from column 4, lines 24-30 where  $A_a$  is described as covering "the entire grounded area of the electrode 14 itself and the grounded walls of chamber 10". As seen from Figure 1 and the above discussion,  $A_a$  and  $A_c$  are not equal.

7. Beisswenger et al describe a capacitive plasma enhanced chemical deposition reactor (Figure 3, #20). Beisswenger et al additionally describe the production of a plasma and also applying charged and uncharged particles onto a substrate. Two electrodes connected to a voltage source are provided, between which a plasma volume excited by high frequency energy is ignited. The areal ratio of the two electrodes is variable in order to influence the energy of the ions impinging on a substrate. Beisswenger et al describe a susceptor electrode within the chamber (Figure 3, # 22; column 4, lines 5-6) configured to support at least one semiconductor workpiece (Figure 3, # 23; column 4, lines 5-6). Beisswenger et al describe a showerhead electrode (Figure 3, # 28; column 4, lines 21-24) within the chamber operably adjacent to the susceptor electrode and configured to provide gaseous reactants into the chamber. Beisswenger et al describe a single RF power generator (Figure 3, #25; column 4, lines 7-9) coupled with the susceptor electrode and the showerhead electrode. The single RF electrode is additionally

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configured to provide RF power to both electrodes to develop a plasma processing environment within the chamber and a desired bias relative to the semiconductor workpiece. Moreover,

Beisswenger et al describe the concept and benefit from an RF power splitter (column 3, lines 35-68). Furthermore, Beisswenger et al additionally portray, according to Figures 3-5, a susceptor electrode within the chamber and a showerhead electrode within the chamber with respective surface areas which are substantially equivalent and modifiable (column 4, lines 46-62).

Beisswenger et al describe the allowed variability of electrode surface areas (column 4, lines 1-4), with the rationale for providing such variability provided (column 4, lines 36-68).

8. It would have been obvious for one of ordinary skill in the art to modify the Shan et al reference (US 5,865,937) by implementing non equal areas of lower and upper electrodes, for the benefit of adjusting the voltage as described in the Shan et al ('637) and Beisswenger et al references, as discussed above.

### *Conclusion*

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alex Ghyka whose telephone number is (703) 305-3407. The examiner can normally be reached on Monday, Tuesday, Thursday and Friday from 7:30 AM to 6:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling, can be reached on (703) 308-3325. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

AGG

March 6, 2003

ALEXANDER GHYK  
PRIMARY EXAMINER

Av 2812  
*Alex Ghys*